

The relationship between tree growth and altitude

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Research Question and Hypothesis

Research Question

Does altitude influence tree growth? Are there other growth conditions that affect tree growth?

Hypothesis

The growth of conifers in Jønnardalen (Altitude: 800m; Latitude: 59.58053 N) is greater than in Furufjell (Altitude: 900m; Latitude: 8.07086 N)

Literature

There are many conditions that influence the tree growth, for example a species' range, climate zone, vegetation, moisture and competition between the trees. The precipitation and the temperature are also important factors for tree growth. In Norway the trees stop growing in winter, because of the low temperatures. They start growing again in spring and grow all through the summer and autumn. This stop in growth is what makes the tree rings so clear.

Trees cannot grow over the tree limit (*- limit for the area where trees can grow*). This is because of the growth conditions, like too low temperature, low atmospheric pressure or lack of moisture.

The reason why the tree growth is greater in Jønnardalen than in Furufjell, is because Furufjell is higher above the ocean/sea-level and closer to the tree limit. The trees grow slower and slower the closer they are to the tree limit.

Materials and methods

Material

Indoor equipment: Pencils, rulers, markers, microscopes, magnifying glass, tape measure, plastic folder, calculator, sandpaper, glue, tree core lath, loupe, PC, Word, rubber, graph paper, skeleton plot, tree core plastic holder, paper, pro scope.

Outdoor equipment: Increment Corer, compass, height measurer

Methods

Assembly of tree core

Lay a strip with glue on the tree core lath, lay the tree core sample over the glue and push it. Write down the number of the tree sample on the tree core lath. Let it dry. Grind down the sample. Start with the rough sandpaper and then go over to the finest paper after some time.

Observation and analysis

Observe the sample with a microscope, loupe or a proscope. Look at the following:

- are there any false tree rings?

- are there any broad or skinny tree rings?
- are there any special features on the sample?

Make a “Skeleton Plot”

- count all the tree rings from the pith to the bark and mark with a pen on each 5. ring.
(remember, do not count the false rings)

-Note which years that there were particularly big/small rings (use a line paper).

-Make a “Skeleton Plot” on a graph paper

-Draw up a timeline on a graph paper(year 0 is the start of the timeline). Let a year be 0,5 mm on the paper. Mark every 5. year.

- Now indicate the extreme ring widths (wide and slim), by using arrows with various lengths. Arrow up= wide, arrow down= slim.

Data summary and calculation of average tree growth

Summarize your data for each location. Calculate average tree growth by counting the number of tree rings on the first 15 cm from the pith. Use the average tree growth per tree to calculate the average tree growth per year for each location.

Data summary

Furufjell

<i>Sample name</i>	<i>Number of rings on 15cm</i>	<i>Average growth per year</i>	<i>Growth pr. Year (first 15 cm)</i>	<i>NB!</i>
<i>Gr.1 A1</i>	68	1,3 mm	1,5 mm	Count in 10 cm not 15
<i>Gr.2 A1</i>	95	1,1 mm	1,5 mm	
<i>Gr.3 B2</i>	83	0,8 mm	1,25	Count in 10 not 15
<i>Gr.4 A1</i>	248	0,5 mm	0,6	
<i>Gr.4 B1</i>	98	1,0 mm	1,5 mm	
<i>Average</i>	118,4	0,94	1,27	

Jønnardalen

<i>Sample name</i>	<i>Number of rings on 15cm</i>	<i>Average growth per year</i>	<i>Growth pr. Year (first 15 cm)</i>	<i>NB!</i>
<i>Gr.1 B1</i>	81	1,7 mm	1,8 mm	
<i>Gr.1 B2</i>	125	0,8 mm	0,9 mm	The sample was only 95 mm
<i>Gr.2 B1</i>	99	1,5 mm	1,5 mm	The sample was only 149 mm
<i>Gr.3 B1</i>	165	0,8 mm	0,9 mm	
<i>Gr.4 B1</i>	73	1,4 mm	1,6 mm	Count in 10 not 15
<i>Average</i>	108,6	1.24	1.34	

Analysis and results

Difficulties

Difficulty faced included among others:

- Bad samples (broken, porous etc.)
- Didn't hit the pith
- Unspecific calculation
- Uncertain features (false rings etc.)
- Didn't catch all the pointer-years
- Faint rings
- Lost equipment
- Obtaining, analyzing and comparing soil conditions data for both sites due to winter conditions.
- Expanding spatial sampling (by analyzing data over many more years)
- Not enough samples/analysis

Results:

From the results we have, it seems that the tree growth per year is greater in Jønnardalen than in Furufjell.

The growth of the trees is affected by the altitude. The trees that grow on a lower altitude has a greater growth than the trees that grow on a higher altitude.

We cannot say something for sure due to few samples, but we have concluded that trees who stand solitary grow faster than trees surrounded by other trees, exposed to competition.

We know from literature that the closer the trees are to the tree limit, the slower they grow and this suggests that our results are correct.

It was a few samples that showed us that the tree growth was better in Furufjell. This is probably due to good growth conditions like small competition and great exposure to sun light.